CHILTON'S

MARCH 1989

FOOD ENGINEERING

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FOOD ENGINEERING

COVER STORY

On October 19, Carnation Co. started-up its new $80-million ice-cream and frozen novelty plant on a 30-acre site in Bakersfield, CA. Plant capacity is more than 35 million gallons of ice cream and frozen novelties per year. Photo by Gregory Murphey, Inc. Chicago.

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This month's Report talks about the rise in sales of cereal breakfast foods as compared to other food categories; the USDA's proposal to reduce inspections at food and processing plants that have good compliance records; FDA's report that pesticide residues are rarely found above tolerance levels in U.S. domestic and imported food supplies; and the Soviet and American trade agreement signed at the IEFP show in Anaheim.

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CHILTON FOOD GROUP

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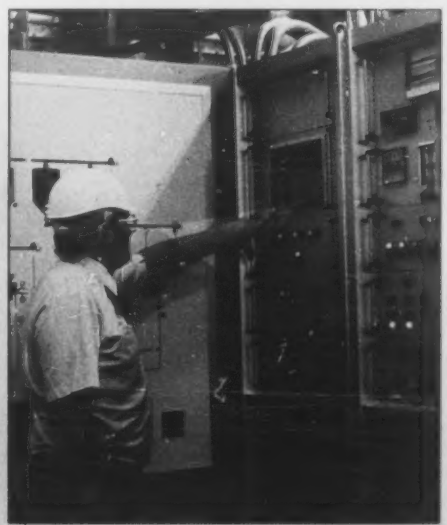

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Special Emphasis

SITE SELECTION

Despite the corporate food fights and mergers and acquisitions of the past few years, new food plant construction is up, and so is the need for help in selecting the best site.

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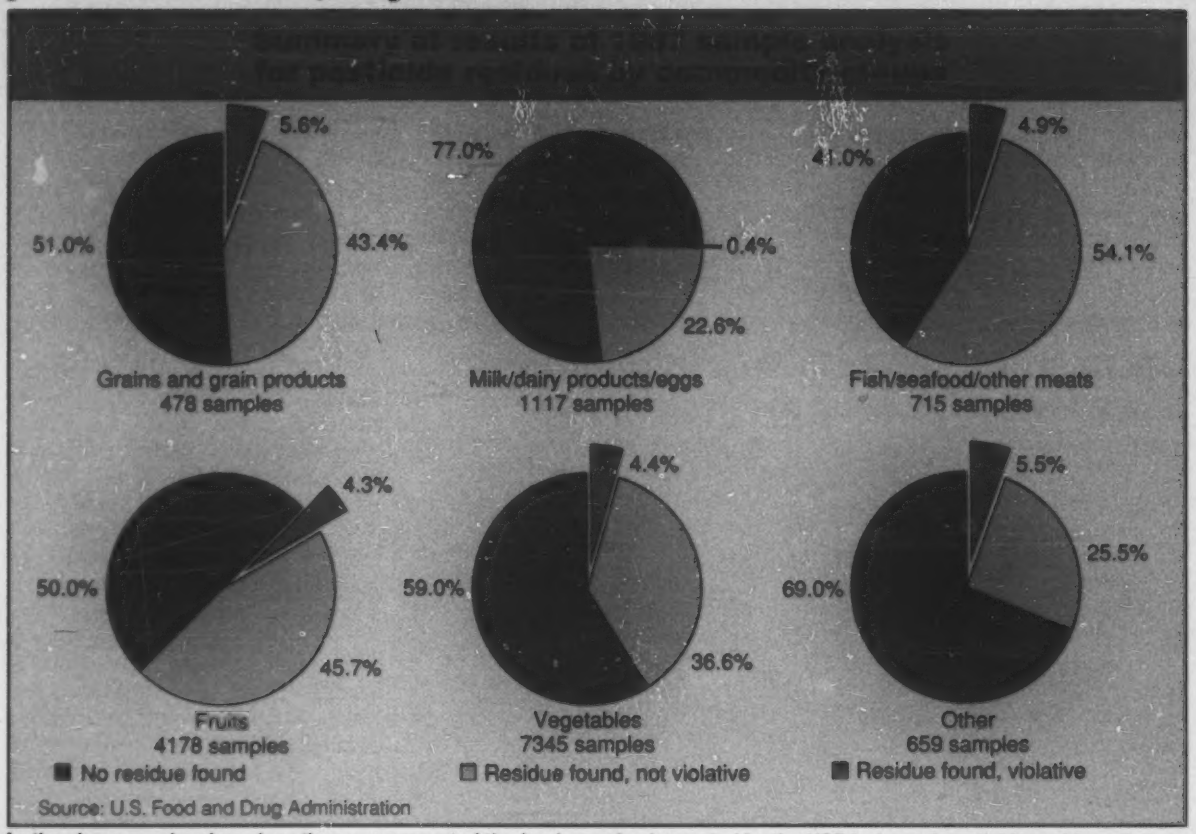
Food supply safe from dangerous pesticide levels, says FDA



As the above graphs show, less than one percent of the food samples inspected by the USDA showed pesticide residues that are higher than acceptable levels. No trace of pesticides were detected in more than half of the fresh vegetables and fruits tested. However, pesticide residue values were slightly higher for imported fresh produce.

More than 25 years of FDA monitoring data shows that pesticide residues are rarely found above tolerance levels in U.S. domestic and imported food supplies and that the American consumer is not exposed to excessive levels of pesticide residues, says FDA in its recent report *Residues In Foods–1987*.

Although no reference is made to the National Academy of Sciences May 1987 report *Regulating Pesticides In Food: The Delaney Paradox*, the FDA report seems aimed at calming consumer fears raised by the controversial NAS report (*FE* July, '87). Media reports of the NAS study focused on its theoretical worst-case scenario that pesticides in foods could cause 20,000 additional cancer cases per year (*FE* August '87). The NAS report did not apply actual pesticide-residue data in its risk assessment, although this data was readily available from FDA (*FE* September '87).

Data compiled over the past 25 years show that "the U.S. population's exposure to pesticide residues is consistently below established safety standards," says FDA, and its report summarizes fiscal 1987 results of the agency's pesticide-monitoring program which "continue to support this observation."

In 1987, FDA reports, 14,492 samples of food in various groups (6,503 domestic and 7,989 import) were analyzed for 253 different pesticides under the regulatory monitoring program. No pesticide residues were found in over 50 percent of the samples, and less than 1 percent of the samples contained residues that exceeded tolerances. As shown in the graph:

- Of more than 3,000 fresh-vegetable samples analyzed, 63 percent contained no residues, less than 1 percent contained residues over tolerances and about 2 percent contained residues for which no tolerance has been established.
- For fresh fruits, no residues were found in 50 percent, less than 1 percent contained residues over tolerance and less than 1 percent contained residues for which no tolerance has been established.
- For imports the picture was basically the same, except that residues for which no tolerance has been established totaled about 4 percent for vegetables and 6 percent for fruits.

• For the 847 domestic dairy-product samples, 76 percent contained no residues and none contained violative residues.

• For imported dairy products, 80 percent of the 270 samples had no residues, no residues were over tolerance, and only 1 percent had residues for an unestablished tolerance level.

These results were supported by 1987 Total Diet Study data, FDA continues. While regulatory monitoring shows that the consumer is not exposed to excessive pesticide-residue levels, the Total Diet Study provides a direct estimate of dietary pesticide intake. In the Total Diet Study, 234 different table-ready food items representative of the American diet are analyzed for more than 200 different chemicals four times each year, for a total of 936 product analyses annually. Although 53 pesticides were found in the 1987 food "market basket," the levels detected were consistently below acceptable daily intake (ADI) standards established by the United Nations' Food & Agricultural Organization (FAO) and the World Health Organization (WHO)—in most cases by orders of magnitude. "For almost all pesticides, the dietary intake is less than 1 percent of the ADI," FDA said.

The study demonstrates that "very low levels of or undetectable pesticide residues in food as consumed," FDA concludes. "These data also show that dietary pesticide intakes are manyfold lower than their ADIs. These findings corroborate the continuing safety of the U.S. food supply with respect to pesticide residues."

USDA trims the fat from inspection programs at food processing plants

USDA meat inspector takes a close look at meat products at a processing plant. Under a new proposal, the USDA may be able to cut down on the amount of inspections made at food processing plants. Source: USDA.

The U.S. Department of Agriculture (USDA) has proposed to reduce meat and poultry inspections at food and processing plants that have good compliance records and increase inspections at operations with poor compliance records. The proposal would not apply to slaughter operations, which would remain under continuous inspection.

The proposal came in the wake of a change in the law that allows the USDA to adjust the amount of inspections performed at processing plants. The federal Meat Inspection Act in 1986 allows the frequency of inspections to be based on the risks posed by each plant's compliance record, the complexity of the processes it performs and its ability to control hazards. The change has also won the approval of the National Academy of Sciences, according to Lester M. Crawford, administrator of the USDA's Food Safety and Inspection Service.

Union blasts plan

The USDA proposal came under fire from the United Food and Commercial Workers International Union, AFL-CIO (UFCW) as posing a threat to worker safety. The UFCW charged that a similar program carried out by the Occupational Safety and Health Administration (OSHA) resulted in "an epidemic of injuries and illness for packinghouse workers along with disclosures that companies failed to keep accurate records."

However, Crawford said the ruling would not affect packinghouse workers since there would be no change in the present system of inspecting slaughterhouse operations. Food processing companies would be trusted to maintain records pertaining to product quality, not worker safety records which is under the OSHA jurisdiction, he added.

The USDA maintains the proposal will strengthen its inspection in 6,300 plants that process meat and poultry by "focusing inspection efforts where they are needed most," according to Crawford. "The proposal is based on years of careful planning and three pilot tests in different parts of the country in various kinds of meat and poultry plants," he added.

The proposed program would utilize a new computerized system that accumulates information from inspection visits. The system would document each plant's record in meeting USDA requirements and keeping track of acceptable and deficient performance. Aided by these records, the USDA would decide the frequency of inspections needed at a given plant.

"Industry will have to assume greater responsibility in conforming to USDA standards, because critical deficiencies found during inspection would mean production delays and product condemnation," Crawford said.

Cereal breakfast foods post gains, consumption of butter melts

Meat	1.2%
Seafood	1.5%
Processed Fruits and Vegetables	2.9%
Canned	2.5%
Frozen	3.8%
Dairy	2.1%
Cereal	3.0%
Confectionery products	4.5%
Soft drinks	4.5%

Source: U.S. Department of Commerce

The above chart shows the estimated percentage increase in value of shipments from 1987 to 1988.

Although production costs continue to escalate, cereal breakfast foods continue to be a big seller with constant-dollar growth of 1988 ringing up an increase of three percent, according to U.S. Department of Commerce estimates in its *1989 U.S. Industrial Outlook*. While most food categories showed modest gains (adjusted for inflation) of one to three percent, dairy categories, including butter and ice cream showed market losses in 1988. Butter shipments slumped by 11.5 percent while the value of ice cream and frozen dessert shipments dipped by 1.8 percent.

In 1988, estimated per capita consumption of all breakfast cereal gained 1.1 percent. Ready-to-eat cereal was the runaway best seller with product shipments for 1988 totaling $4.96 billion. And as advertisers tout the nutritional value of bran, multigrain and fiber, these cereals showed an impressive gain of 1.9 percent in consumption.

In percentage increase, hot cereal is close on the heels of ready-to-eat. Still, the category remains much smaller than cold cereal: $579 million in shipments in 1988.

Advertising spending continues to escalate with 1987 hitting $664 million, up 25 percent from 1986. Kellogg is the fourth largest network television advertiser and expanded its network budget 43 percent in 1987 (the last year these figures are available). These expenditures represented 78.4 percent of all Kellogg advertising.

Of the total 1987 advertising dollars spent by cereal companies, Kellogg spent 45.7 percent; General Mills, 24.9 percent; General Foods, 16.2 percent; Quaker Oats, 8 percent; and RJR Nabisco, 5.2 percent.

Future shipments of cereal breakfast foods are expected to increase 2.7 percent. Per capita consumption of cold cereal is expected to reach 11.94 pounds in 1989. Per capita consumption of hot cereal is predicted to reach 3.67 this year.

Consumers paid more money for their favorite cereals in 1988 since the '88 drought drove commodity prices up and packaging proved to be costlier. Producer costs for ready-to-eat cereal increased 7.2 percent and hot cereal rose 5.6 percent. Retail prices reflected these costs by increasing 5.9 percent.

Consumers appear to have reached for more dairy foods in 1988 with shipments increasing by 2.1 percent from 1987. Part of this increase was due to the 5.5 percent growth in shipments of condensed and evaporated milk being countered by the 11.5 percent plummet of butter.

Cheese showed continued strength, led by Italian varieties. Shipments of cheese increased from 1987's $11.6 billion to $11.9 billion in 1988. This upward trend is expected to continue into 1989 with shipments predicted to reach $12.5 billion.

The domestic fruit, vegetable and specialty food-processing industries increased their total production 2.9 percent in constant dollars to $41 billion in 1988.

Canned goods producers accounted for 64 percent of the total value of industry shipments in 1988 and last year, canned foods grew 2.5 percent in constant dollars thanks to the growth in jarred ethnic foods, baby foods and sauces. Canned and jarred products received a shot in the arm from the upsurge of interest in Italian sauces and Hispanic foods (see the February issue of *Food Engineering*, page 73). However, the popularity of basic canned fruits and vegetables is declining since consumers increasingly prefer fresh or frozen foods.

Soups boiled with activity in 1988, as drysoups ladled almost 30 percent of the soup market in 1988. This represents more than twice the share the category enjoyed a decade earlier. The demand for prepared soups and other microwavable products is also increasing in response to the changing needs of a society with limited time for meal preparation.

Aseptically packaged juices were strong in 1988, with children becoming number one consumers of boxed juices.

The rocketing appeal of boxed juices has helped reverse the downward trend in per capita consumption that has plagued the canned juice industry since the 1970s. Per capita consumption of canned juice in 1988 was estimated to be eight gallons, up from seven gallons in 1985.

In 1988, the estimated current-dollar value of shipments by the frozen food industry rose by 3.8 percent. The demand for frozen convenience foods has benefited from the jump in the proportion of U.S. households that have microwave ovens from ten percent in 1976 to 60 percent in 1987. Microwave ovens are now also found in almost 60 percent of all workplaces.

Specialty desserts grew only two percent, down from a hefty five percent annual growth between 1982 and 1987. While the demand for frozen baked goods and low-calorie items has increased, the popularity of frozen entrees has leveled off. Currently, more than a third of U.S. households purchased low-calorie entrees in 1988, up from 25 percent in 1986.

The value of shipments by the meat and meat products industries rose an estimated 1.2 percent (adjusted for inflation), with red meat shipments less than 1 percent in 1988.

Constant dollar industry shipments of red meats are expected to increase less than one percent. Beef production will continue to decline in 1989, while pork production will reach a plateau in early 1989. Overall, per capita beef consumption will fall to under 72 pounds, while per capita pork consumption at best will remain at about

Circle 12 or see FEM, p. 363→

62 pounds, according to Commerce Department estimates.

For the second year in a row, more poultry was eaten than beef. Between 1987 and 1988, per capita consumption of poultry increased 5.9 percent to 82.5 pounds. This trend away from red meat on the part of consumers is further evident by the increased percentage of poultry consumed, 37 percent in 1988, compared to 26 percent in 1977. Per capita consumption of beef dropped 3.4 percent during the same period.

Since the trend in beef consumption per capita is not expected to reverse, more and more meat packers are shifting away from commodity products and moving into brand name and other value-added items. In 1988 boxed beef, which constituted only 46 percent in 1979, accounted for 85 percent of total beef consumed.

The Department of Commerce has predicted that the meat-packing industry will continue to improve profitability through product innovations and closing of inefficient plants. The number of federally inspected meat plants declined 12.2 percent between 1985 and 1987, and a further decline is expected for 1988. It appears that more red meat companies are expanding into the poultry business and vice versa. Between 1985 and 1987, establishments requiring both federal meat and poultry inspection grew 11 percent, to 3,270 plants.

U.S. shipments of poultry and related products rose 2.6 percent to $12.6 billion in 1988. The poultry industry has benefited from rising demand for attractively priced frozen dinner entrees and other convenience foods. As a result, per capita consumption of poultry increased from 53.2 pounds in 1977 to 82.5 pounds in 1988. However, profit margins have suffered because of oversupply, according to the Department of Commerce.

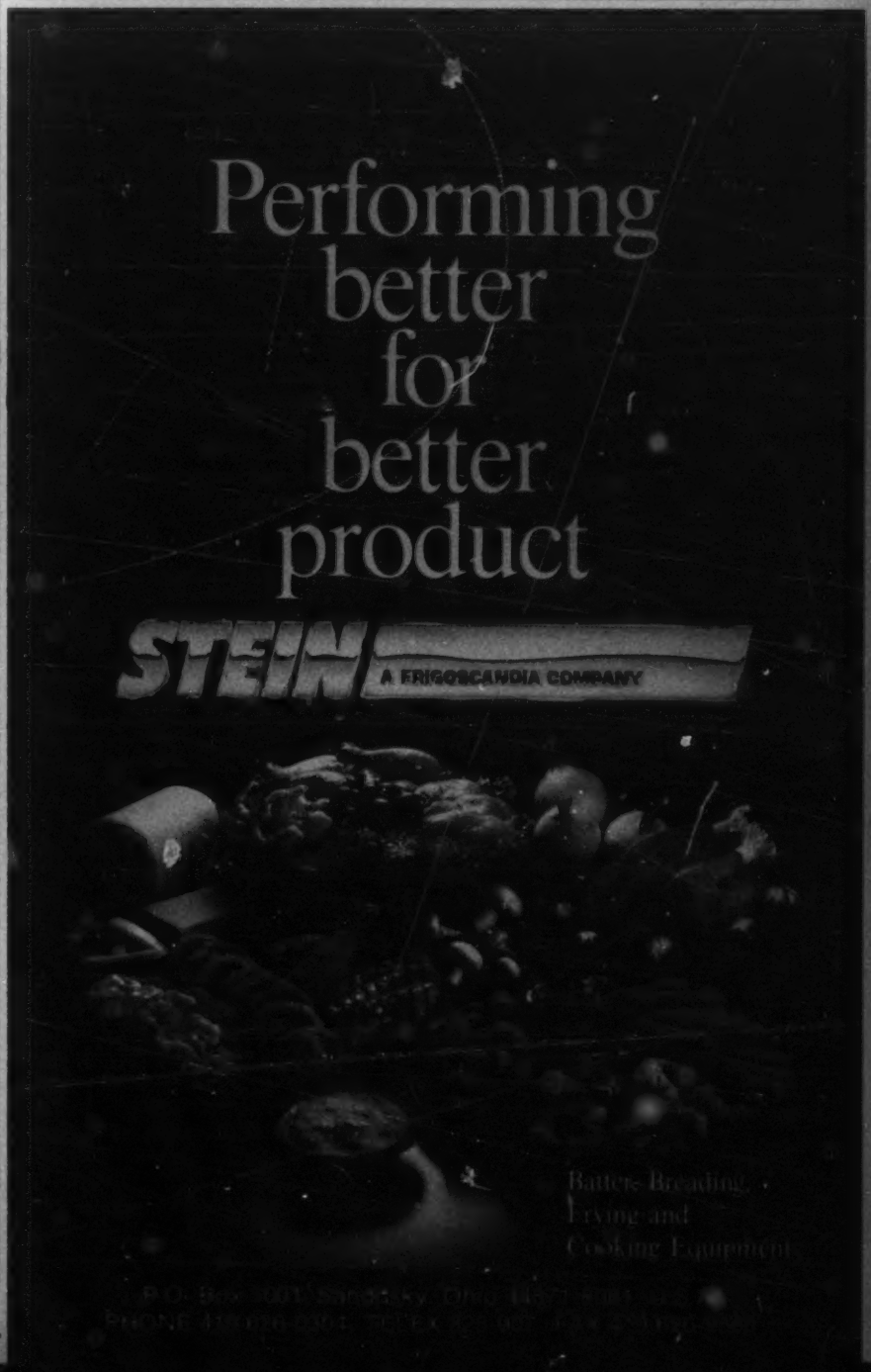
The poultry industry, although outpacing the red meat industry, will experience only a 1.7 percent growth in constant-dollar value of shipments. Poultry processors are expected to continue to offer consumers new poultry products in response to consumers' demands for convenience and variety.

There will be a continual quest for leaner meats, the Department of Commerce predicts. By manipulating animal hormones, food scientists might be able to reduce fat by 50 percent, the Department of Commerce adds. This potential development could save the meat industry about $2 billion in feed costs alone.

Red meat consumption is expected to continue its downward trend between 1989 and 1993.

Processed fishery products continue to reel in profits with a 1.5 percent increase in the value of shipments over 1987. The seafood industry is in the enviable position of being able to sell more and more of its products at even higher prices, according to the Commerce Department.

Copies of the 1989 U.S. Industrial Outlook are available for $24 pre-paid by contacting the Government Printing Office, Washington, DC 20402-9325.



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CAPITAL SPENDING '89

EQUIPMENT BUYERS SURVEY

Our Executive Advisory Panel takes a look at 1989 and shares its thoughts on budgets, equipment purchases and production projections.

Food Engineering's most recent survey of its Executive Advisory Panel found an industry almost universally optimistic as it enters the 1990s, and willing to exhibit that optimism by projecting healthy expenditures during 1989.

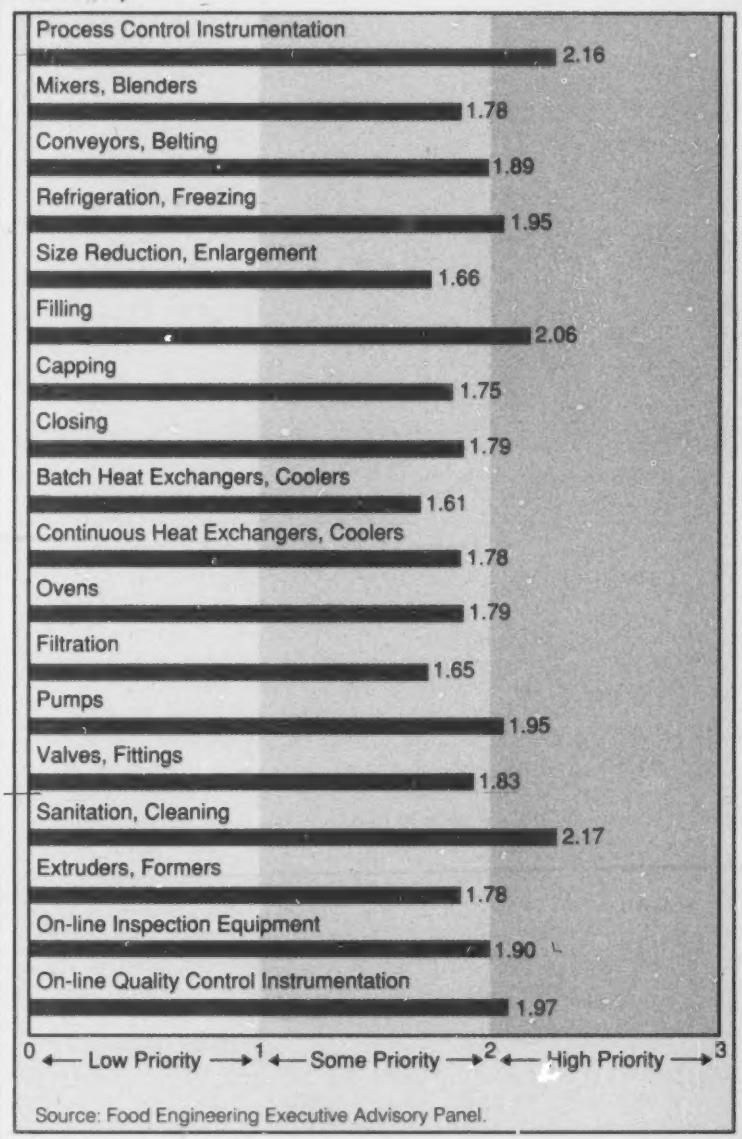
"Generally, sales look good, profits look steady to improving. The food industry appears to remain one of the brighter spots in American industry," said one panel member.

Some of the good "vibes" come from knowing that companies have streamlined their operations for greater productivity and profitability. Others point to expansion programs in progress or completed which will permit them enhanced manufacturing capability to meet demand. Others are finding management more receptive to new ideas and new products. Some are finding acceptance of their brand name to be the key to success this year in a marketplace where competition remains keen.

The optimism, however, is not unanimous. Those who view 1989 as a "tough year" are doing so for some of the same reasons that others feel optimistic: for example, seeing the continuing flood of new products as a hindrance, not a help, to success. Although one optimistic respondent feels the "American business spirit is alive and well – we are rising to the challenge," another reflects a more downbeat view saying the industry should "tighten its belt for a rough

LINDA K. FREEMAN
Contributing Editor

PURCHASE PRIORITY — 1989
(ratings show what respondent priorities were for equipment indicated)

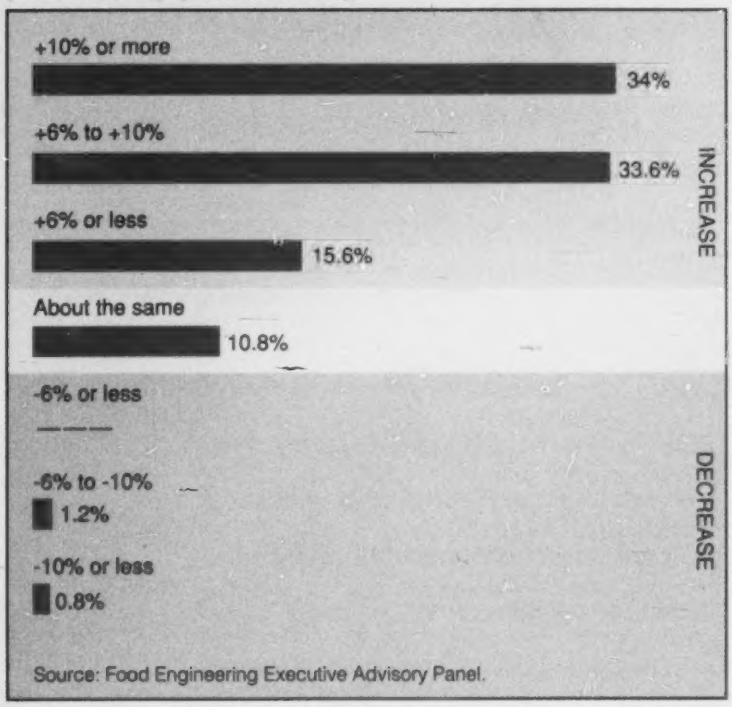


Source: Food Engineering Executive Advisory Panel.

CAPITAL SPENDING '89

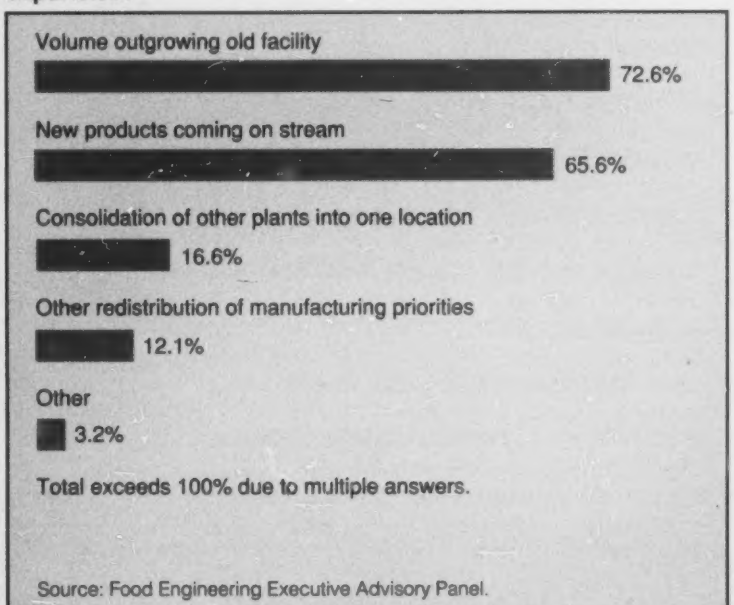
PRODUCTION INCREASE/DECREASE 1988-1989

(numbers reflect panel estimates)



Source: Food Engineering Executive Advisory Panel.

Respondents were asked for the reasons for recent or planned expansion.



Total exceeds 100% due to multiple answers.

Source: Food Engineering Executive Advisory Panel.

one—lots of new products vying for little shelf space." A number of respondents view competition as a real problem. "And I thought 1988 looked like a rough year!" said one, "1989 promises to be a son of a gun for sure."

Some of the pessimism of the panel is based on concern about the continued "mergermania" within the industry. "Leveraged buy-out and possible breakup of business units will doubtless have a large and currently unpredictable effect on our company," said one. "Heightened focus on short-term profits due to the current takeover environment has restricted capital project funding to only include essential or very fast payback projects (less than six months)," said another.

Budgets are healthy

Still, for whatever caution there may be, almost across the board sizable amounts of capital are available for purchases.

Looking at the figures themselves (see chart labelled "Budgeting"), a significant portion of capital expenditures is projected to fall in the $4 million or more category, certainly not a sign of caution or pessimism.

One of the reasons for projections of substantial capital outlays is that 34 percent of our panel respondents foresee a 10 percent or more increase in production, and another 33.6 percent see a 6-10 percent increase. "We plan on growing by the addition of new products and increased sales in present lines," says one panel member.

Others are expanding into new markets, both national and international, heightening their expectations of success, and raising the need for enhanced production capabilities.

A significant percentage of respondents expected slightly higher levels of manufacturing capabilities to come online between 1988 and 1990 than during the previous two year period. If you use the panel's responses as a barometer for the industry, bakery products and dairy products show the greatest projected rise in manufacturing space. Canned fruits/vegetables/entrees, fats and oils and confectionery are projecting slight decreases. The rest of the food industry segments say they're looking at smaller percentage increases.

The amount of expansion planned or already implemented ranged across the board (see chart), with the heaviest concentrations coming in the 10-30,000 square foot brackets, but a surprising amount of expansion is expected to exceed 100,000 square feet.

Volume outgrowing present facility capa-

If manufacturing space was/will be expanded from 1987-1990, approximately how many square feet?

Less than 10,000	21.0%
10,000-19,999	12.1
20,000-29,999	10.8
30,000-39,999	4.5
40,000-49,999	3.2
50,000-59,999	7.6
60,000-69,999	0.6
70,000-79,999	1.9
80,000-89,999	1.3
90,000-99,999	0.0
100,000 or more	10.2

Source: Food Engineering Executive Advisory Panel.

bility was the number one reason cited for recent or planned expansion. An amazing 72.6 percent cited increased volume, while 65.6 percent said increased manufacturing space was needed to handle the number of new products coming onstream.

These percentages reflect the optimism of the panel. One respondent felt expansion was necessary in order to achieve "good production to meet sales and to avoid shipping delays. Projected and approved expansions will accomplish this goal." Others see expansion as the key to offering "more value added products, such as mixes, formed products, pre-cooked, etc."

Not everyone was adding more manufacturing space, but responses to *Food Engineering*'s queries showed a high level of activity across the industry in retrofitting and rehabbing work being done to older, outdated manufacturing space. Updating facilities and equipment is far easier on the capital budget than building a totally new facility or production area.

More than 74 percent of the respondents related company retro/rehab activities to the "need for greater productivity." Another 57.6 percent cited "replacement of outdated technology" as the reason, while 50.3 percent said the drive for greater automation sparked the rehab/retro work. Several respondents voiced the opinion that there should be "more sympathy and emphasis put on upgrading present operations to improve productivity, rather than installation of new, untested equipment."

Arriving at the decisions to install new equipment, or rehabilitate the present

BUDGETING, 1989, BY SEGMENT

(dollar figures reflect company-wide equipment budgets for fiscal 1989)

	Under 50K	50-99K	100-249K	250-499K	500-999K	1-1.9M	2-3.9M	4+ M
Meat Products	9.8%	8.2%	9.8%	1.6%	11.5%	16.4%	6.6%	27.9%
Bakery Products	15.8	5.3	8.8	10.5	3.5	14.0	7.0	28.1
Dairy Products	9.3	8.0	6.7	9.3	8.0	9.3	9.3	34.7
Flavors/Food Ingredients	15.4	13.8	13.8	9.2	7.7	9.2	6.2	15.4
Canned Fruit/ Veg/Entrees	4.8	2.4	9.5	4.8	7.1	19.0	4.8	42.9
Fats & Oils	16.3	2.3	16.3	9.3	9.3	9.3	4.7	27.9
Frozen Fruit/ Veg/Entrees	12.8	7.7	5.1	5.1	2.6	15.4	7.7	38.5
Confectionery Products	10.9	4.3	15.2	4.3	10.9	8.7	8.7	28.3
Cereals/Grain Products	9.5	6.3	9.5	6.3	4.8	11.1	6.3	33.3
Beverages	10.0	6.7	10.0	5.0	6.7	11.7	5.0	38.3
Other	14.1	1.4	14.1	7.0	5.6	12.7	12.7	23.9

Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Executive Advisory Panel.

Respondents were asked if their location had expanded manufacturing space in the last two years — 1987, 1988. And, if their location is planning an expansion in the next two years.

	1987-1988		1989-1990	
	Yes	No	Yes	No
Meat Products	42.6%	54.1%	45.9%	49.2%
Bakery Products	43.9	52.6	54.4	42.1
Dairy Products	45.3	52.0	54.7	42.7
Flavors/Food Ingredients	47.7	50.8	49.2	49.2
Canned Fruit/Veg/Entrees	42.9	52.4	40.5	54.8
Fats & Oils	44.2	53.5	41.9	55.8
Frozen Fruit/Veg/Entrees	41.0	53.8	43.6	51.3
Confectionery Products	41.3	52.2	39.1	52.2
Cereals/Grain Products	55.6	42.9	55.6	42.9
Beverages	48.3	48.3	50.0	46.7
Other	56.3	42.3	49.3	49.3

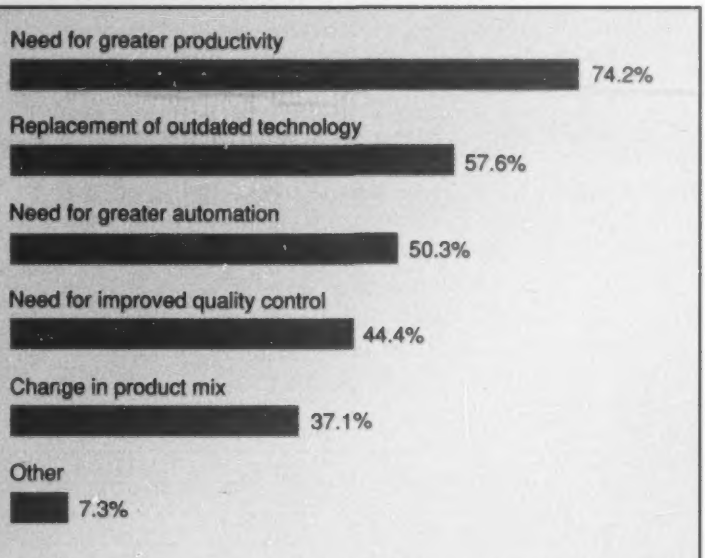
Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Executive Advisory Panel.

Respondents were asked if their location had been retrofitted/re-habbed from 1987-1989? And is their location planning a retrofit/re-hab from 1989-1990?

	1987-1988		1989-1990	
	Yes	No	Yes	No
Meat Products	42.6%	49.2%	49.1%	50.9%
Bakery Products	40.4	52.6	42.3	57.7
Dairy Products	52.0	42.7	54.3	45.7
Flavors/Food Ingredients	49.2	49.2	44.3	55.7
Canned Fruit/Veg/Entrees	38.1	54.8	38.5	61.5
Fats & Oils	48.8	46.5	47.5	52.5
Frozen Fruit/Veg/Entrees	43.6	43.6	45.5	54.5
Confectionery Products	45.7	45.7	38.5	61.5
Cereals/Grain Products	57.1	38.1	58.3	41.7
Beverages	48.3	43.3	38.2	61.8
Other	42.3	54.9	38.8	61.2

Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Executive Advisory Panel.

Reasons for recent or planned retrofit/rehab.



Source: Food Engineering Executive Advisory Panel.

manufacturing space, both of which are capital intensive, is often a lengthy and complex procedure. A significant percentage of respondents feel that communication is a large problem in handling capital projects—communication between engineering and the project implementer, between levels of project management, and between various groups at different locations and different plants. Many felt more input from line and production workers was necessary and many felt that more people should be involved in the decisions, including research and development, technical services, packaging engineers, etc. so that consensus decisions could be reached.

Tied into communication was the desire for better planning. "We need to start one to two years ahead," says one respondent. A task force approach was recommended to provide "longer-term planning, with expedient short-term project completion." Long-range plans, it was suggested, should be discussed with top supervisors, again toward the goal of consensus decisions. Part of better planning, said the panel, is quicker action, quicker approval, less paperwork, and less involvement of the parent company.

The wish list

Part of each Executive Advisory Panel survey is a request for respondents to tell us what need or want is currently unfulfilled in available food industry equipment and technology.

This year, by far the longest wish list is for improvements in inspection systems, including:

- A piece of equipment able to inspect the integrity of a heat seal of a blister pouch as they are being produced at 200+ per minute.
- On-line seal integrity testing for heat-sealed, retortable containers.
- High speed in-line container leak or seal integrity testing for foil sealed containers.
- Absolute leak detection for plastic containers.
- Automatic inspection of filled cans to detect missing covers, knocked down flanges, or other problems in sealing.

Also high on the priority list is a broad range of detection equipment to detect metal and the presence of other "foreign bodies" and the need for more flexible, "more human" robots (especially a concern of our meat industry respondents).

More sophisticated moisture measurement equipment was another request of a number of respondents, as were more flexible case packer and cartoning equipment to handle more difficult containers and provide a broader range of task fulfillment.

The food industry survived the stock market debacle of '87 and has survived the continuing drive for mergers and acquisitions to arrive optimistic and financially healthy at the doorway to the 1990s.

Special Emphasis

SITE SELECTION

HIGH-TECH SYSTEMS KEY TO SITE CHOICE

Location and quality of the labor force are still the key factors in site selection, but the integration of advanced manufacturing systems such as CIM and JIT is becoming increasingly important.

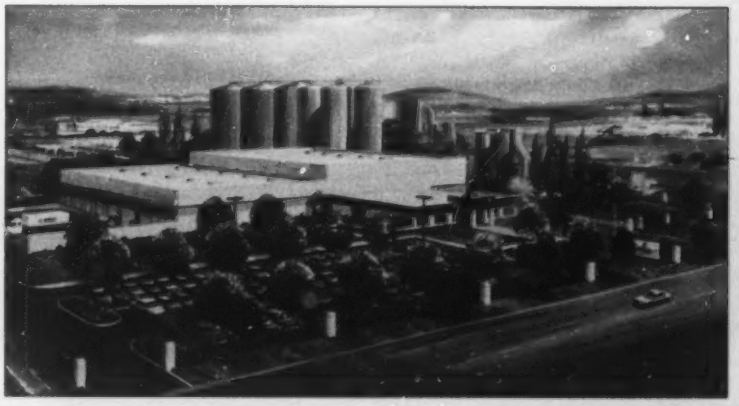
The corporate food fights of the 1980s and the resulting mergers and acquisitions have had little effect on the number of new plants built over the last few years. In fact, *Food Engineering's* "11th Annual New Plant Survey" (November 1988, page 85) reported new plant construction up 10 percent over 1987.

Alan D. Thomas, manager of industrial engineering, Day & Zimmermann, Philadelphia, PA, says that requests from clients for site selection help have actually increased due to mergers and acquisitions. Many of the larger food companies want to construct the factory of the future and are willing to start from scratch.

Just what is this factory of the future? According to Thomas, it is the right mix of technology for a particular food plant. Most importantly, it is the integration of Computer Integrated Manufacturing (CIM) and Just-in-Time (JIT) principles. "If a plant can accomplish this integration and be close to their suppliers, they can reduce operating costs and be successful," Thomas said. (For a closer look at the impact of these technologies on site selection, see the sidebar on page 116.)

Choosing the site

Location, proximity to market, and market share (if the plant is in an expansion mode) are the three most important factors in site selection, according to Jim Loorya, director of area development for Pacific Gas and Electric, San Francisco, CA. "Once a location is decided upon, the key element is the availability of transportation. Other factors to consider are the availability of labor and if the state is a right to work state or not," Loorya said.



Close proximity to nearly 50 percent of the corn used to make its product was one of the reasons Cornnuts Inc. selected Fresno as the site for its new plant. Photo courtesy of Fresno County Economic Development Corp.

When people think of California, they usually think of world class cities like Los Angeles or San Francisco, but not all of California is expensive, according to Loorya. Other areas such as Fresno and Sacramento offer prospective food plants competitive prices for labor cost and labor availability.

For example, Cornnuts Inc. is in the process of building a 60,000 square foot manufacturing facility on 15 to 20 acres in the southern industrial area of Fresno. The facility will combine two basic production operations: a grain elevator for drying, cleaning and storage of corn, and a processing/packaging plant where the corn is turned into finished snack food product.

Before selecting Fresno, Cornnuts narrowed the choice to California, where one-third of the product is purchased and where 50 percent of the corn used for the product is grown. The company also wanted its manufacturing facility to be located near a metropolitan area that could easily provide the supplies and services required for manufacturing. Other pluses for the area included a modern waste treatment facility, large labor

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pool and proximity to two major highways, two railroad lines, and a major airport, in addition to financial incentives.

State assistance

Kathleen Miller, account executive for food processing for the Michigan Department of Commerce in Lansing, says that access to market is the overriding factor in where plants decide to locate. "If raw product is important to the food plant, they will locate near it; if emphasis is on the final product, the plant will locate near the consumer; but access to market permeates both decisions where to locate," Miller told *FE*.

Access to quality labor is also important, according to Miller, as is a favorable comparison of labor costs. The quality of productivity within the labor force is also an important consideration, since quality of labor can differ from state to state, she said.

No site selection project can be completed without working with some branch of government, be it state or county. Following are Miller's tips (presented at the Food Plants 88 conference held last October in Chicago) for working with government agencies during a site selection project.

•*Be flexible*—Don't be rigid about whether you pursue an existing building, a "green-

The impact of JIT and CIM on site selection

Advanced manufacturing technologies and philosophies such as Just-In-Time (JIT) and Computer Integrated Manufacturing (CIM) are having a tremendous impact on the site selection process. JIT principles stress the importance of proximity to suppliers, distributors and customers. CIM principles focus chiefly on using information processing to achieve total coordination throughout your company's organizational structure and operating environment.

Food processing was actually the first industry to practice JIT principles. Before refrigeration and high speed transportation, handling perishable ingredients and products always dictated a location close to the market and supplier.

CIM, on the other hand, has not been as widely adopted among food processors, perhaps because of a lack of understanding of what CIM really is.

Alan D. Thomas, manager of industrial engineering at Day & Zimmermann, Inc., Philadelphia, PA, believes CIM is more of an operating philosophy than a new technology.

"CIM is as much a management issue as it is a hardware or software issue—maybe even more so," he said. "It is the sharing of information throughout every operation and department of the company to achieve an established set of business goals."

"For example, if the sales department's goal is to sell 5 million chocolate wafers and 5 million vanilla, the plant must have the flexibility to achieve this product mix," Thomas said. "Merely being able to produce 10 million wafers would not achieve the same market results."

CIM addresses not only the processing/manufacturing operation but the entire business of processing, which includes product and process design, processing, distribution through aftersale service and support. This demands that every person and equipment type be integrated from process control through corporate management to achieve the same set of shared goals.

How do JIT and CIM principles affect site selection? In the traditional site selection process, the most important criterion is usually the projected cost to acquire, build and operate the facility. The selected site should also provide employees with a satisfying quality of life, community services and a comfortable cost of living. Land cost, utility costs, environmental regulations, topography, geotechnical conditions and other factors are established, and their level of importance to the company is determined and weighed. Data is then collected, and after a comprehensive investigation, the factors are scored to establish a relative rank of the analyzed sites.

"A JIT approach coordinates activities so that the ingredients and materials to make a product are immediately available when needed and the resources required to perform every step of production are in place," he says.

JIT impacts the site selection process by influencing labor and management relations, the level of automation, and required storage space. Thomas defines JIT as the elimination of waste from the process, where waste is all activities that add cost but not value to the product.

In the analysis process, he advises first identifying activities that are considered waste and then eliminating them. Examples: transportation of raw material to the production facility and from the plant to the ultimate customer; storage of raw material, work-in-process and finished product; and inspection of incoming raw material and outgoing finished product. Total costs can be minimized by eliminating the need to perform these activities.

"Ideally, this would mean building a facility *next* to your suppliers and customer, designed for 100 percent reliable product and process quality," explains Thomas.

He emphasizes, however, that locating close to suppliers is a goal of JIT that has several advantages. It makes a greater number of smaller shipments of raw material cost-effective and reduces storage requirements. In addition to reducing operating costs, it fosters a close working relationship with vendors.

JIT may imply a culture change to some U.S. food processors. The JIT environment emphasizes a culture where management and labor work together in harmony to continually solve problems and improve the operation.

"It's important to find a location where people are open to accepting new ideas and operating environ-

SITE SELECTION

field" site, or geographic boundaries. You may eliminate some desirable options just into the next county. Some economic developers may be aware of private developers who will build and then lease you the site.

•*Be clear about your priorities*—The clearer you can be about the importance of the various factors in locating a plant, the more valuable state assistance will be to you. If waste water treatment is a major operations cost and problem, and consequently, a municipal hookup is critical, then indicate that. The developer can start with that factor and save you time. Then the other factors you've identified can be added according to your priorities.

•*Don't be afraid of confidentiality*—Most state government economic developers can and will work on a confidential project. The Freedom of Information Act is seldom used and is usually too time consuming.

•*Allow direct access to decision makers*—If you use a consulting firm to represent you, allow direct conversations with your company even if you don't give the name. Letting the consultant convey your priorities and answer questions about your specific needs may result in misunderstandings and incomplete information for this important decision.

Strategic business goals help you focus in on the site selection process. CIM and JIT principles help define and clarify your needs.

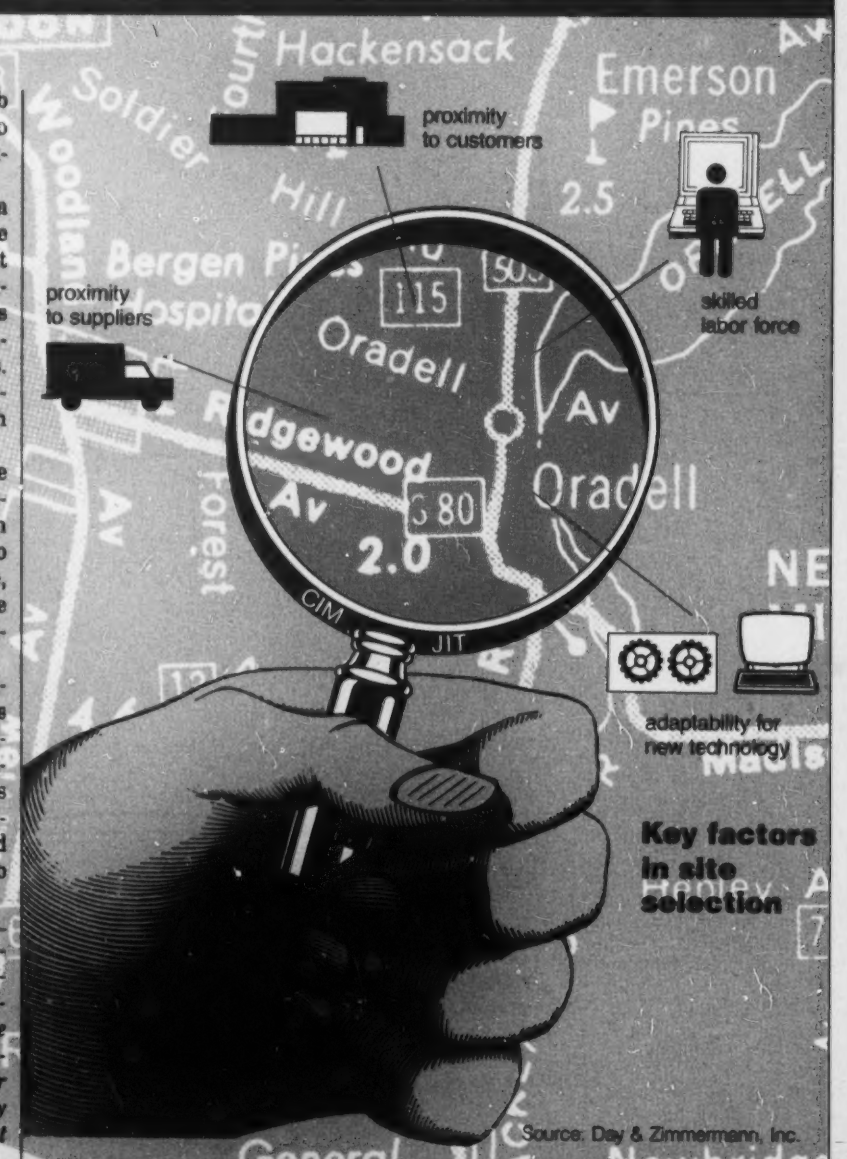
ments," notes Thomas, "because job responsibilities will be expanded to achieve a flexible, cross trained workforce."

Just by relocating and establishing a new operation, a new working culture will develop. But, both management and workers must be trained to encourage communication. This requires the development of an effective management team to lead the business. The selected site should be in a marketplace that has or can attract such individuals.

CIM affects the same factors in the site selection process—but in a different way. CIM integrates the operation through a change of culture, similar to JIT but with more reliance on on-line, real-time information processing. The key is integration using state-of-the-art systems.

Site selection following the principles of JIT and CIM encompasses many intangible considerations in addition to the traditional, easily measured criteria. The starting point is identifying your business goals and determining the level of technology and combination of resources needed to support this corporate mission.

Alan D. Thomas is manager of industrial engineering at Day & Zimmermann, an engineering firm headquartered in Philadelphia, where he oversees a full range of facilities planning and modernization services for the food industry. He was previously manufacturing consulting manager at a "Big 8" professional services firm.



	Chicago Metro Area	San Francisco Metro Area	Denver Metro Area	Kansas City Metro Area	Omaha Metro Area	Minneapolis Metro Area	Milwaukee Metro Area	Sioux Falls Metro Area
Nonexempt Labor Weighted Average Hourly Earnings	$10.54	$12.65	$10.75	$10.96	$10.33	$11.07	$11.38	$8.01
Annual Base Payroll Costs ($1,000)	$3,713	$4,456	$3,787	$3,861	$3,639	$3,899	$4,008	$2,821
Fringe Benefits ($1,000)	$1,374	$1,649	$1,401	$1,429	$1,346	$1 443	$1,483	$1,044
Total Annual Labor Costs ($1,000)	$5,087	$6,105	$5,188	$5,290	$4,985	$5,342	$5,491	$3,865
Electric Power Costs ($1,000)	$330	$312	$256	$298	$210	$197	$271	$207
Natural Gas Power Costs ($1,000)	$482	$338	$417	$383	$294	$267	$430	$271
Occupancy Costs ($1,000) Amortization	$1,925	$2,075	$1,821	$1,878	$1,793	$1,915	$1,868	$1,727
Property Tax Cost	$630	$116	$181	$200	$206	$440	$318	$175
Heating and Air Conditioning	$178	$76	$127	$139	$110	$133	$165	$135
Total Occupancy Costs ($1,000)	$2,733	$2,267	$2,129	$2,217	$2,109	$2,488	$2,351	$2,037
Transportation Costs($1,000)	$868	$1,356	$881	$795	$810	$924	$877	$891
Total Annual Geographically-Variable Operating Costs ($1,000)	$9,500	$10,378	$8,871	$8,983	$8,408	$9,218	$9,420	$7,271

Figures include all major geographically-variable operating costs based on 1987 U.S. dollars. Start-up and relocation costs are not included.

Source: The Boyd Company, Princeton, NJ.

Food industry operating costs in major U.S. markets were compiled for a study conducted by The Boyd Company, location consultants.

•*Work with both state and local development offices*—State officials are trained to know how their state compares to others and what state assistance programs are available. Local officials are trained to know local services and incentive programs and local assets for your company. Singularly they provide only half the picture, together they provide the whole picture.

•*Don't underestimate the assistance you can get from government*—State governments are getting creative in their assistance. Don't hesitate to ask for assistance they do not traditionally provide. In addition to the types described above, you may also be able to get information about university assistance programs and agricultural production.

Cost comparison

Location consultants and design and construction engineering firms can offer potential clients cost comparisons of sites across the nation (see chart above). After a client has considered all the choices—utilities, taxes, labor, transportation—he or she can choose the site with the best bottom line.